Fachgebiet Audiokommunikation
Prof. Dr. Stefan Weinzierl

Master Thesis

Investigating language-invariance in timbre semantics

The proposed thesis is part of a cross-cultural study conducted by the Audio Communication Group at TU Berlin and the Cognitive and Computational Musicology Group at the Aristotle University of Thessaloniki (Greece). The objective is to investigate whether it is possible to establish a language-invariant (German/Greek) semantic space of instrumental timbre as well as a language-invariant version of the Room Acoustical Quality Inventory (RAQI) [1].

Most prior research work on timbre semantics has investigated acoustic musical instruments by means of recorded samples or synthetic emulations. Common semantic dimensions have been summarized as luminance, texture, and mass [2]. They also have been shown in some cases to be relatively stable across different languages and cultures [2], [3], although more systematic explorations would be necessary to establish a cross-cultural and language-invariant semantic framework for timbre. To this purpose, the proposed thesis will

1. collect semantic ratings from a large number of listeners (N = 90; German group only) of a highly diverse set of stimuli comprising acoustic and electromechanical instrument timbres (n = 54) presented in different rooms via dynamic binaural synthesis;
2. combine the German dataset with data from an identical Greek experiment currently in progress;
3. perform testing/optimization of measurement invariance between the salient semantic dimensions in each linguistic group using the combined German-Greek dataset [4], [5];
4. establish language-invariant factor models for the combined German-Greek dataset;
5. calculate stimulus-based mean scores for each factor with the combined German-Greek dataset;
6. combine an existing German rating dataset used to construct RAQI [1] combined with data from a Greek RAQI experiment currently in progress;
7. perform analyses 3–5 using the combined German-Greek RAQI dataset.

Literature

[1] S. Weinzierl, S. Lepa, and D. Ackermann, “A measuring instrument for the auditory perception of rooms: The room acoustical quality inventory (raqi),” *J. Acoust. Soc. Am.*, vol. 144, no. 3, pp. 1245–1257, 2018.

[2] A. Zacharakis, K. Pastiadis, and J. D. Reiss, “An interlanguage study of musical timbre semantic dimensions and their acoustic correlates,” *Music Percept.*, vol. 31, no. 4, pp. 339–358, 2014.

[3] S.-i. Iwamiya and M. Zhan, “A comparison between Japanese and Chinese adjectives which express auditory impressions,” *J. Acoust. Soc. Japan (E)*, vol. 18, no. 6, pp. 319–323, 1997.

[4] T. L. Milfont and R. Fischer, “Testing measurement invariance across groups: Applications in cross-cultural research,” *Int. J. Psychol. Res.*, vol. 3, no. 1, pp. 111–121, 2010.

[5] R. Kühne, “Testing measurement invariance in media psychological research,” *J. Media Psychol.*, vol. 25, no. 4, pp. 153–159, 2013.

Requirements

- Research interest in cross-cultural translation of acoustic concepts
- Basic knowledge in room acoustics and timbre psychoacoustics
- Extended knowledge in factor analysis and structural equation modeling (extended support will be provided by supervisor)
- Experience with MATLAB/Python/R programming

Supervisors

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